FY_2002 PROPOSED SCOPE OF WORK for: **Project #: 115**

Effects of Flaming Gorge Dam releases on Lodore/Whirlpool fish community

Lead Agency: Larval Fish Laboratory, CSU; Bureau of Reclamation; U.S. Fish and Wildlife Service

Jointly Submitted by: Larval Fish Laboratory, CSU; Bureau of Reclamation; U.S. Fish and Wildlife Service

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Date: July 26, 2001 (Revised October 19, 2001)

Category:
_ Ongoing project
_ Ongoing-revised project
x Requested new project
_ Unsolicited proposal

Expected Funding Source:
x Annual funds
_ Capital funds
_ Other (explain)

I. Title of Proposal:

Cumulative Effects of Flaming Gorge Dam Releases, since 1996, on the Fish Community in Lodore and Whirlpool canyons, Green River.

II. Relationship to RIPRAP:
Green River Action Plan: Mainstem
II.D. Evaluate and revise as needed flow regimes to benefit endangered fish populations.

III. Study Background/Rationale and Hypotheses: In FY01, the Recovery Implementation Program (RIP) revised the RIP Recovery Action Plan to include evaluating and revising, as needed, flow recommendations for the endangered fish throughout the Upper Colorado River Basin. Flaming Gorge Flow and Temperature Recommendations (FGFTR; Muth et al. 2000) were approved by the RIP in FY01. Long-term implementation of these recommendations will occur when NEPA and ESA compliance is completed. However, during the past five years some operations that match these recommendations have been implemented.

Positive benefits of flow and temperature regimes for native endangered fishes may be offset by negative effects of increased distribution and abundance of certain nonnative fishes. This is a major concern of managers of the Colorado River in Grand Canyon, where a large population of endangered humpback chub (*Gila cypha*) already exists. There, the decision to enhance the riverine thermal regime to benefit mainstem populations of humpback chub needs to be weighed against potential increases in populations of nonnative fish which may compete with or prey upon native fish. Similarly, shifts in flow and temperature regimes of the Green River downstream from Flaming Gorge Dam need to be evaluated to determine if the relative benefits to endangered fishes outweigh those for nonnative fishes.

Therefore, the primary purpose of this proposed study is to determine the cumulative effect that flow and temperature regimes have had on the fish community in Lodore and Whirlpool canyons of the Green River and recommend how to monitor effects into the future. A secondary purpose is to determine the distribution of the humpback chub population in Whirlpool Canyon to serve as the basis for future monitoring efforts. Future monitoring (i.e. population estimation), if deemed necessary, will be needed to evaluate the contribution of the Whirlpool Canyon population of humpback chub to the overall recovery of the species. Information gathered will be used to evaluate whether flow and temperature regimes from Flaming Gorge Dam are benefitting endangered fishes in the Green River without increasing abundance of nonnative fishes.

LODORE

Since 1962, the Green River through Lodore Canyon has been sampled at intervals, often associated with dam-related construction or operation changes. Descriptions of the fish community are available prior to regulation (pre-1962), immediately following construction of Flaming Gorge Dam (1964-1966; Vanicek et al. 1970), and following the installation of temperature control device to warm releases (1978-1980; Holden and Crist 1981). The most recent investigations (1994-1996; Bestgen and Crist 2000) were conducted to determine the effect of flow recommendations as proposed in the 1992 Biological Opinion. In their

analysis, Bestgen and Crist (2000) document trends in the fish community by comparing their contemporary sampling (1994-1996) with historical data sets. Two recommendations that came from that study were: 1) manipulate Flaming Gorge Dam releases to more closely approximate natural flow and temperature, and 2) monitor the fish community and habitat particularly if the recommended flow and temperature regimes are implemented (with specifics identified).

Five years has passed since the fish community in Lodore Canyon has been sampled. Since that time flow and temperature recommendations for the Green River have been approved by the RIP (Muth et al. 2000). Those recommendations will not be fully implemented until ESA and NEPA compliance activities are complete. However, in recent years some reservoir operations that match the Muth et al. (2000) recommendations have occurred. For instance, flows in excess of 8,000 cfs were released in Spring, 1997, and in excess of 10,000 cfs were released in Spring,1999 (see Fig.1) The magnitude of these spring releases, which have not occurred since 1986, still fell within the 1992 Biological Opinion recommendations, but were timed to be consistent with the Muth et al. (2000) recommendations. In addition, base flow releases in the summers of 2000 and 2001 have been patterned to follow the hydrologic water year similar to the Muth et al. (2000) recommendations. As a result, preliminary data suggests that main channel temperatures in excess of 20°C were achieved in Lodore Canyon in July and August 2000.

Muth et al. (2000) recognized "uncertainties" regarding effects of flow and temperature regimes, one of which was potential shifts in the Lodore Canyon fish community. The main goal of this investigation is to further evaluate the effects of flow and temperature regimes on the cool and warm water fish community of the Green River downstream from Flaming Gorge Dam, particularly Lodore Canyon and the reach downstream. The study proposed herein, therefore, will compare three data sets: 1. fish community (relative abundance, distribution and size structure of native and nonnative species) as described by Bestgen and Crist (2000) vs. the 2002 - 2003 data set; 2) Green River flow data from WY 1990-1996 (flows that shaped the 1994-1996 fish community) vs. WY 1997-2003 (flows that shaped the 2002-2003 fish community); 3) Green River temperatures in Lodore Canyon (similar to the flow analysis).

Changes in flow and temperature regimes may affect the fish community in the study reach because several species exhibit well-defined abundance gradients within the study area. For example, warm-water tolerant Colorado pikeminnow (*Ptychocheilus lucius*), red shiners (*Cyprinella lutrensis*) and sand shiners (*Notropis stramineus*) were common in lower Lodore Canyon, but were rarer or non-existent in the upper Canyon (Bestgen and Crist 2000). Conversely, cool-water brown trout (*Salmo trutta*) and white sucker (*Catostomus commersoni*) declined in abundance in lower reaches of Lodore Canyon and chubs (*Gila* spp.) and northern pike (*Esox lucius*) were relatively rare throughout. Comparison of fish and physical habitat data collected in this study to historical data sets should allow us to ascertain reasons for fish community changes over time.

Understanding shifts in distribution and abundance patterns of endangered and nonnative fishes, will provide information necessary to assess potential positive and negative effects of changes in physical habitat, including flow and temperature regimes. This initiates an

adaptive management process (along with other ongoing studies downstream) to address "uncertainties" which may lead to refining flow recommendations to benefit the endangered fishes. As postulated by Bestgen and Crist (2000) the following shifts (list not complete) in the fish community in Lodore Canyon may occur due to warmer main channel temperatures and a more natural hydrograph:

Potential Positive Effects

Native Species

- Colorado pikeminnow - increased abundance, expanded distribution upstream, potential for spawning in Lodore Canyon (ripe male Colorado pikeminnow were collected in the lower canyon in 2000; T. Modde, USFWS; pers. comm.)
- Native chubs - increased roundtail chub abundance and distribution upstream, increased roundtail spawning, immigration of humpback chub from the Yampa River or Whirlpool Canyon
- Native suckers - increased distribution and abundance, increased reproduction and recruitment; decreased hybridization with nonnative white suckers.

Nonnative Species

- Nonnative salmonids - decreased abundance and distribution
- Nonnative cyprinids - decreased abundance and distribution of redside shiners.
- Northern pike - decreased abundance and distribution

Potential Negative Effects

Native Species

- A return to more natural flows and temperatures in Lodore Canyon may result in a decreased abundance and distribution of mountain whitefish and mottled sculpin. However, a decrease in these cooler water species and the concomitant increase in the warmer water natives would likely signal a return to a more natural (i.e., pre-dam) assemblage of native species in this stretch of river.

Nonnative species

- Nonnative cyprinids: increased abundance and distribution of red shiner, sand shiner, fathead minnow, and carp
- Catfishes: increased abundance and distribution of channel catfish and black bullhead
- Bass and sunfish: increased abundance and distribution
- Northern pike: increased abundance and distribution

WHIRLPOOL

Located immediately downstream from the confluence of the Green and Yampa rivers, flow and temperatures in Whirlpool Canyon are also affected by releases from Flaming Gorge Dam. Temperature recommendations (Muth et al. 2000) were derived, in part, to benefit the native fish in Whirlpool Canyon.

Whirlpool Canyon has been largely ignored in recent years and was last sampled for humpback chub between 1986 and 1989 (Tyus and Karp 1991) when three fish were collected. Since 1989, significant change in seasonal flow releases from Flaming Gorge Dam have been implemented.

Additionally, in 1999, the USFWS collected young-of-the year (YOY) humpback chub in the Island Park reach of the Green River (Chris Kitcheyan, USFWS and D. Snyder, CSU Larval Fish Lab; personal communications). Early life history investigations of both humpback and roundtail chub in Westwater Canyon on the Colorado River indicated that young chubs were found in close proximity to the adult populations and did not disperse a great distance downstream (Chart and Lentsch 1999). Young humpback chub collected in Island Park may have been spawned in the lower Yampa Canyon, but more likely were produced in Whirlpool Canyon.

The purpose of extending sampling downstream into Whirlpool Canyon would be twofold: 1) to characterize the fish community in Whirlpool Canyon to serve as a baseline for evaluating future effects of the FGFTR immediately downstream from the Yampa River confluence, and 2) to characterize the distribution of humpback chub, which will in turn direct future monitoring efforts for this species. Sampling the adjacent canyons of Lodore (regulated Green River) and Whirlpool (regulation partially ameliorated by the Yampa) will provide a more comprehensive evaluation of the FGFTR, and sampling both canyons simultaneously would be a cost effective approach to providing the Recovery Program with: 1) a basis for the evaluation of a major management action (FGFTR), and start the adaptive management approach, and 2) gather preliminary information to determine how the Whirlpool Canyon population of humpback chub contributes to recovery.

Hypothesis testing:

Bestgen and Crist (2000) pooled 3 years of data to describe the fish community in Lodore in general terms of species composition and relative abundance, in an effort to compare their findings with those of previous researchers. Work proposed herein would first build on that trend analysis, while forming the basis for hypothesis testing (i.e., statistical analysis) in the future. We will re-visit the 1994-1996 data set and test for significant changes in the fish community. Observed changes in the fish community will be discussed as they relate to the suite of changes in flow and temperature that have occurred since that time. The general null hypotheses will be:

H_o : Flows through Browns Park and Lodore Canyon (during the spring and summer) have not changed from the period 1991-1996 (flows that characterized the fish community in Lodore Canyon during the Bestgen and Crist (2000) study) to the period 1997-2003 (flows that characterized the fish community in the present study.).

H_o : Summer water temperatures through Browns Park and Lodore Canyon (during the spring and summer) have not changed from the period 1991-1996 (temperatures that characterized the fish community in Lodore Canyon during the Bestgen and Crist (2000) study) to the period 1997-2003 (temperatures that characterized the fish community to be studied herein).

H_o : The relative abundance, distribution, and size structure of native and nonnative fish in Browns Park and Lodore Canyon has not changed since 1994-1996 (Bestgen and Crist (2000) study).

IV. Study Goals, Objectives, End Product:

Goal: Determine if changes in Green River flow and thermal regimes since 1996 are associated with changes in distribution and abundance patterns of native and nonnative fishes in Browns Park and Lodore Canyon. Information gathered will be used to evaluate whether flow and temperature regimes from Flaming Gorge Dam are benefitting endangered fishes without increasing the abundance of nonnative fishes.

Objective 1. Determine if shifts in distribution and abundance of large-bodied fishes have occurred in Brown's Park and Lodore Canyon by comparing the results of shoreline electrofishing and trammel net surveys with the results of previous studies, particularly Bestgen and Crist (2000). We will also remove nonnative fishes captured during sampling efforts.

Objective 2. Determine if shifts in the distribution and abundance of small-bodied fishes have occurred in Brown's Park and Lodore Canyon by comparing results of low-velocity, nearshore seining with the results of previous studies, particularly Bestgen and Crist (2000). We will also remove nonnative fishes captured during sampling efforts.

Objective 3. Determine if Colorado pikeminnow spawn in the Green River upstream from the Yampa River confluence by establishing a larval drift station in lower Lodore Canyon, and by summer sampling to determine presence of ripe adults.

Objective 4. Compare the hydrological records for two time periods (WY 1991-1996 vs. 1997-2003) as recorded by the USGS at their gaging station (09234500) near Greendale, Utah .

Objective 5. Monitor main channel temperatures in Brown's Park and through Lodore Canyon in coordination with other ongoing efforts.

Objective 6. Compare and contrast the summer thermal regime of the Green River through Browns Park and Lodore Canyon for two time periods (WY 1991-1996 vs. 1997-2003). Temperature models will be used to generate thermal regimes, where empirical data are lacking.

Goal: Recommend a program to monitor the effect of future Flaming Gorge operations on the fish community in Lodore and Whirlpool Canyons.

Objective 7. Expand sampling of the fish community into Whirlpool Canyon to establish a baseline assessment.

Objective 8. Monitor flows in Whirlpool Canyon by analyzing flow data collected by the USGS at the Deerlodge Park gage on the Yampa River, and the Green River gages near Greendale and Jensen, Utah.

Objective 9. Monitor temperatures in Whirlpool Canyon using temperature data collected by the USFWS at Mitten Park (as part of Project 19b) and with the placement of additional

thermographs. Analyze this data comparatively with data collected in lower Lodore Canyon (as identified above) and data collected in the lower Yampa River (ongoing USFWS effort).

Objective 10. Based on the conclusions of these investigations (Obj. 1-9), recommend a process to monitor future effects of operations at Flaming Gorge Dam on the downstream fish community.

Goal: Characterize the humpback chub population in Whirlpool Canyon, which will direct monitoring in the future. Understanding the distribution and status of humpback chub in Whirlpool Canyon can be used to assess how this population contributes to recovery goals and to determine whether flow and temperature regimes of the Green River are compatible with life history and habitat requirements.

Objective 11. Gather preliminary information to describe the distribution, relative abundance, and size structure of *Gila* spp. in Whirlpool Canyon through the fish community sampling methodologies.

Objective 12. Characterize the *Gila* spp. collected in Whirlpool Canyon by assessing the species qualitatively as described in Douglas et al. (1989) and quantitatively by gathering the necessary morphometric measurements identified in Douglas et al. (1998).

Objective 13. Recommend how to monitor the humpback chub population in Whirlpool Canyon, based on the findings of these preliminary investigations.

End Product: RIP annual reports submitted following the 2002 and 2003 field seasons. A peer-reviewed draft final project report submitted to the Biology Committee by Sept. 1, 2004.

V. Study area

In general, the fish community will be sampled between the Swinging Bridge in Brown's Park and the lower end of Rainbow Park in Dinosaur National Monument. Specifically, sampling will occur in the following reaches of river:

Brown's Park: Beginning at the Swinging Bridge and extending 8 km downstream.
Lodore Canyon: Entire Canyon, which consists of four contiguous, 8-km reaches.
Whirlpool Canyon: Entire Canyon, which consists of 2 contiguous, 8-km reaches.
Island and Rainbow Parks: sampled for small-bodied fishes during summer and fall to compare with existing data sets.

VI. Study Methods/Approach

This two-year investigation is patterned closely after the work of Bestgen and Crist (2000). Data will be collected in a manner that generates catch per unit effort (CPE) metrics (fish/hour electrofishing, small-bodied fish/m^2 habitat seined, larval fish/m^3 water, fish/23m-trammel net hour) with associated variance estimates to enable within-study, and comparative statistical analyses (i.e., comparisons with data collected in 1994-1996 and

provide the basis for comparisons with future data sets). Additional sampling techniques (angling, hoop nets, and minnow traps) will be used on an experimental basis.

Flow data collected by the USGS at several of their gaging stations on the Green and Yampa Rivers will be used to address Objectives 4 and 8. All available temperature data will be reviewed to address Objective 6; however, there will be data gaps. To fill data gaps we will use temperature models developed by Bestgen (2000) and Carron (2000) for the upper Green River.

Three trips will be conducted each year. Sampling will begin in the spring with a 4-day trip (3-person crew) to set thermographs and sample small-bodied fish with seines. Thermographs will be set in a main channel habitat, near the upstream terminus of each 8-km reach (this aspect of the study will be coordinated closely with Project 19b, George Smith, Principal Investigator). Thermographs will be downloaded and replaced, as needed, on subsequent trips throughout the study period. Two, 6-day sampling trips, utilizing a 6-person crew, will target the entire fish community and will occur each year in early summer and the fall when the river has reached a scheduled base flow.

Large-bodied fishes; Electrofishing: Two electrofishing rafts (as described in Bestgen and Crist 2000) will simultaneously sample the left and right shoreline. Each two-person crew (one boat operator and one netter) will collect all fish. Each 8-km (5-mile) ***reach*** will be divided into five contiguous 1.6-km (1-mile) ***sections***. At the lower end of each section all fish will be enumerated as an adult or sub-adult (based on pre-determined total length ranges per species) and electrofishing effort will be recorded. **Note: due to safety concerns, electrofishing will not be conducted in the vicinity of some Lodore Canyon rapids**. Rare fish (T&E species) will be weighed, measured and PIT-tagged. Thus, mean CPE/trip/reach will be generated from as many as 10 section samples.

In addition to simple enumeration, all fish will be measured and weighed in two sections (both shorelines) of each reach on each trip to characterize size structure and length/weight relationships.

Descriptive statistics will be used to describe CPE results, lengths, and weights of fish. Analysis of variance testing (specific tests will be selected based on the distribution of data) will be used to determine the significance of differences in CPE and body measurements of the more commonly collected species between reaches within years, by reach from year 1 to year 2, and where possible with historical data sets.

Large-bodied fishes; Trammel netting: Multi-filament trammel nets (23m x 1.8m; 25-cm outer mesh/2.5-cm inner mesh) will be set at two locations in Lodore Canyon and at two locations in Whirlpool Canyon each trip. Trammel nets collect a variety of species, but have been used in other studies as a primary gear type to collect native chubs in canyon-bound reaches of the Green (Chart and Lentsch 1999) and Colorado Rivers (Chart and Lentsch 2000, Valdez and Ryel 1995, McAda 2000). Trammel nets will be fished during crepuscular and nighttime hours at camp sites in Lodore and Whirlpool Canyons. Nets will be set in low velocity habitats and along eddy lines. The number of nets set will be contingent on habitat availability and accessibility. Nets will be checked every 2 hours.

All fish will be measured, weighed and tagged as necessary. Dorsal and anal fin rays will be enumerated from all chubs collected. Any suspected humpback chub will be photographed, primarily for the purpose of acquainting other researchers with the chubs found in Whirlpool Canyon. Appropriate morphometric measurements (as identified in Douglas et al. 1998) will be collected.

Statistical analyses of trammel net catch rate of the more common species will be made to determine if significant differences exist between reaches, between years of this study, and between historical data sets. Although the trammel netting program will be more opportunistic, our intention is to determine its usefulness in a long term monitoring program.

Large-bodied fishes; other gear types: In addition to electrofishing and trammel netting, other sampling techniques such as angling and trap nets may be employed in order to evaluate the efficiency of possible inclusion into a monitoring program. Angling will also be used to supplement total numbers of adult Colorado pikeminnow collected and marked for movement and length/weight analyses.

Small- bodied fishes; Seining: The purpose of this sampling will be to track shifts in distribution and abundance of the small-bodied nonnative (red shiner, sand shiner, fathead minnow) and native (speckled dace) cyprinids, and YOY of all other species. Sampling during the various times of year is expected to answer specific questions. Sampling in the spring will provide data on over-winter survival of this portion of the fish community, summer sampling should provide data on annual catostomid reproduction, and the fall sampling should detect the presence of Colorado pikeminnow and native chub YOY.

Target habitats will be described in three categories: 1) shallow/swift (riffles, shallow runs - target species: speckled dace, mottled sculpin, YOY and juvenile catostomids (native and nonnative)), 2) moderate to low flow (shoreline areas, small secondary channels - target species: juvenile catostomids (native and nonnative), nonnative cyprinids, speckled dace, young chubs and pikeminnow), 3) no flow (pools and backwaters) YOY pikeminnow, particularly in the fall, and chubs and early life stages of all species). Two habitats in each category will be sampled in each reach. Two or more seine hauls will be taken in each sampled habitat for a total of 84 seine hauls per trip. Physical measurements, as described in ISMP protocols, will be gathered to quantify habitat dimensions and calculate CPE. Seines used in this study will conform with the ISMP - recommended gear type. Backwater habitats are important nursery areas for many species, but are not common in these canyon bound stretches of the Green River. Therefore, backwaters may be sampled opportunistically.

Readily identified endangered species will be measured and released alive. Other fish will be preserved in 10% buffered formalin and processed at CSU/LFL.

Again, appropriate analyses of variance will be used to determine significance of difference in catch rates of small-bodied fish on a spatial and temporal basis.

Minnow traps have been successful in collecting YOY chubs in the Grand Canyon and Little Colorado River and will be used on an experimental basis in Lodore and Whirlpool Canyons.

Small-bodied fish: Larval Drift: The purpose of this sampling component is to determine if Colorado pikeminnow are spawning in the Green River upstream from the Yampa River confluence. The Larval Fish Lab at Colorado State University has taken the lead on sampling drifting Colorado pikeminnow larvae in the Yampa and Green Rivers (Bestgen et al. 1998). Similar sampling methodologies and data interpretation will be incorporated on the Green River in lower Lodore Canyon.

VII. Task Description and Schedule

Task 1: set and maintain thermographs
Task 2: sample main channel fish community (large-bodied fishes)
Task 3: sample small bodied fish community
Task 4: sample larval drift and process samples
Task 5: process preserved samples of small-bodied fish (seine hauls)
Task 6: prepare and submit annual report
Task 7: prepare final report (includes incorporation of peer review comments)
Task 8: submit draft final report to Biology Committee.

Note: The principal investigators welcome input in the form of comments on study design, analysis / interpretation of project data, and assistance in the field from any interested Recovery Program agency personnel, however, due to budgetary constraints, that input can not be compensated with project funds.

Schedule: FY02

Task	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1							x			x		x
2										x		x
3							x			x		x
4												
5												
6												
7												
8												

Schedule: FY03

Task	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1							x			x		x
2										x		x
3							x			x		x
4												
5												
6		x										
7												
8												

Schedule: FY04

Task	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1												
2												
3												
4												
5												
6		x										
7												
8												Sept 1

VIII. FY_2002 Work: Covers first year sampling, sample processing and annual reporting.

– Deliverables/Due Dates: Annual Report of FY02 field activities due to PD's office November 15, 2002

– Budget:

April Trip - Four-day / three-person trip to address: Tasks 1 (set thermographs) and 3 (monitor small bodied fish with seines) and Task 5 (process seine samples)

Quantity	Description	Unit cost	LFL	BOR	USFWS	Total
Personnel						
4 pers days	1 Biologist	$400/day	1,600			1,600
8 pers days	2 Technicians (4 days each)	$120/day	960			960
Trip supplies						
12 pers days	per diem	$30/pers/day	360			360
600 miles	vehicle mileage	$0.35/mile	210			210
1	vehicle shuttle	$75/vehicle	75			75
	sampling (Whirlpaks®, preservatives, etc)		200			200
	wear and tear on camp/ sampling gear		100			100
Sample processing						
84	seine hauls	$50 / sample	4,200			4,200
Equipment (first year purchases)						
8	Hobo temp thermographs	$100		800		800
2	Seines	$200	400			400
April Trip totals			**8,105**	**800**		**8,905**

Fish Community Monitoring Trip Costs (six-day/six-person): one in July and September, to address: Task 1(monitor thermographs), Task 2 (monitor large-bodied fish), Task 3 (monitor small-bodied fish with seines) and Task 5 (process seine samples).

Quantity	Description	Unit cost	LFL	BOR	USFWS	Total
Personnel						
12 pers days	2 Biologists (6 days each)	$400/day	2,400	1,200	1,200	4,800
32 pers days	4 Technicians (6 trip days +prep day+tear-down day)	$120/day	1,920		1,920	3,840
Trip supplies						
44 pers days	per diem	$30/pers/day	660	90	570	1,320
1800 miles	mileage (3 vehicles x 600 mi)	$0.35/mile	210	210	210	630
3	vehicle shuttles	$75/vehicle	75	75	75	225
	sampling (Whirlpaks®, preservatives, etc)		100			100
	wear and tear on camp/ sampling gear				200	200
	generator / boat gas				30	30
Sample processing						
84	seine hauls	$50/sample	4,200			4,200
Fish Community Monitoring cost per trip			9,565	1,575	4,205	15,345
Annual Fish Community Monitoring costs						
2	**sampling trips**		**19,130**	**3,150**	**8,410**	**30,690**
Equipment (first year purchases)						
	Misc equipment (dipnets, electronic balances, measuring boards, etc		1,500			1,500
1	Outboard motor (9.9hp)	$2000		2,000		2,000
1	Smith-Root GPP	$4000		4,000		4,000
6	Trammel nets	$200		1,200		1,200
2	Seines	$200	400			400
	subtotals		1,900	7,200		9,100
Fish Comm. Monitor. FY02 Totals			**21,030**	**10,350**	**8,410**	**39,790**

Larval Drift - addresses Task 4. Costs identified represent the incremental cost (assuming lower Yampa station is fully funded as identified in Project No. 22f) to expand drift sampling in the Lower Lodore. Costs include replacement nets and flow meters, sample processing, and other gear.

Description	LFL	BOR	USFWS	Total
Larval Drift: Task 4	**9,000**			**9,000**

Analyze data for annual report preparation, start analysis for final report : addresses Tasks 6 & 7.

Description	LFL	BOR	USFWS	Total
Reporting: Tasks 6 & 7	**8,000**			**8,000**

FY2002 Budget Summary: condenses tables above

Description	LFL	BOR	USFWS	Total
April Trip totals	8,105	800		8,905
Fish Comm. Monitor. FY02 Totals	21,030	10,350	8,410	39,790
Larval Drift: Task 4	9,000			9,000
Reporting: Tasks 6 & 7	8,000			8,000
FY2002 TOTAL	**46,135**	**11,150**	**8,410**	**65,695**

FY_2003 Work: Covers second year sampling, sample processing and annual reporting.

– Deliverables/Due dates: Annual Report of FY03 field activities due to PD's office November 15, 2003.

– Budget:

Description	LFL	BOR	USFWS	Total
April Trip totals	8,105	800		8,905
Fish Comm. Monitor. FY02 Totals	19,130	3,150	8,410	30,690
Larval Drift: Task 4	9,000			9,000
Reporting: Tasks 6 & 7	8,000			8,000
FY2003 TOTAL	**44,235**	**3,950**	**8,410**	**56,595**

FY_2004 work

– Deliverables: Peer reviewed draft final report due to Biology Committee, Sept 1, 2004.

– Budget:

Description	LFL	BOR	USFWS	Total
Task 7&8: Final Reporting	**14,000**	**3,000**	**5,000**	**22,000**
FY2004 TOTAL	**14,000**	**3,000**	**5,000**	**22,000**

IX. Budget Summary
FY 2002 - $65,695
FY 2003 - $56,595
FY 2004 - $22,000
Total: - $144,290

X. Reviewers

Doug Osmundson, U.S. Fish and Wildlife Service, Grand Junction, CO
Kirk LaGory, Argonne National Laboratory, Argonne, IL
Rich Valdez, SWCA, Flagstaff, AZ

XI. References

Bestgen, K.R. and L.W. Crist. 2000. Response of the Green River fish community to construction and re-regulation of Flaming Forge Dam, 1962-1996. Final Report of Colorado State University Larval Fish Laboratory to Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado

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